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Veronicastrum noguchii (sect. *Plagiostachys*, Plantaginaceae), a New Species from Japan

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Veronicastrum noguchii K. Uehara, K. Saiki & T. Ando (Plantaginaceae), from Chiba Prefecture, Japan, is described as new. It is similar to *V. villosulum* (Miq.) T. Yamaz. in having a subglobose inflorescence, but differs in having recurved hairs on the stem, the leaf base cordate or occasionally truncate, the leaf margin crenate, the leaf surface sparsely pilose, bracts sparsely pilose and narrowly oblong to ovate, and narrowly triangular to linear subglabrous calyx lobes.

Key words: Chiba Prefecture, endangered species, Isumi-shi, *Veronicastrum*

Veronicastrum Heist. ex Fabr. (Plantaginaceae) in eastern Asia comprises four sections: *Pterocaulon* T. Yamaz., *Plagiostachys* (Franch.) T. Yamaz., *Leptandra* (Nutt.) Benth. (= section *Veronicastrum*) (Yamazaki 1957), and *Calorhabdos* (Benth.) D. Y. Hong (Chin & Hong 1979). Section *Plagiostachys* [type: *V. axillare* (Siebold & Zucc.) T. Yamaz.] is characterized by a terete or striate, arching or ascending stem that forms a new shoot at the apex when it touches the ground, an axillary inflorescence, and an actinomorphic corolla with a long tube. Yamazaki (1957) enumerated 12 species in section *Plagiostachys* from northeastern Asia (China, Taiwan, and Japan). Chin & Hong (1979) recognized two additional Chinese species as members of this section [*V. robustum* (Diels) D. Y. Hong and *V. rhombifolium* (Hand.-Mazz.) P. C. Tsoong], and transferred *V. simadae* (Masam.) T. Yamaz. (a species endemic to Taiwan) and *V. yunnanense* (W. W. Sm.) T. Yamaz. to sections *Pterocaulon* and *Calorhabdos*, respectively. Chin & Hong (1979) treated *V. yamatsutae* (T. Yamaz.) T. Yamaz., *V. venosum* (Hemsl.) T. Yamaz., and *V. plukenetii* (T. Yamaz.) T. Yamaz. as infraspecific taxa of *V. stenostachyum* (Hemsl.) T. Yamaz. Thus, nine species of section *Plagiostachys* are currently known in eastern Asia. Five species are endemic to China [*V. stenostachyum*, *V. longispicatum* (Merr.) T. Yamaz., *V. latifolium* (Hemsl.) T. Yamaz., *V. robustum*, and *V. rhombifolium*], and two species are endemic to Japan [*V. liukiuense* (Ohwi) T. Yamaz. and *V. tagawae* (Ohwi) T. Yamaz.]. The two remaining species occur in both countries [*V. axillare* and *V. villosulum* (Miq.) T. Yamaz.].

The species of *Veronicastrum* described here shares the general morphological features of section *Plagiostachys*, but is distinct from any known species of the section. We propose this plant as a new species, *V. noguchii* K. Uehara, K. Saiki & T. Ando, and describe it with special emphasis on its distinction from *V. villosulum*, since *V. noguchii* was erroneously reported as *V. villosulum* by Noguchi *et al.* (2009).

Veronicastrum villosulum was described by Miquel (1866) as a species of *Paederota* L., based on a specimen collected in Japan by Phillip Franz von Siebold. Although it was cultivated as an ornamental or medicinal plant during Siebold's stay in Japan, its natural habitat was long unknown. *Veronicastrum villosulum* is now an endangered species in Japan, with natural populations report-

ed for only two sites: Fuchu, Tarui-cho, Fuwa-gun, Gifu Prefecture (Muro 1953) and Sadamitsu, Tsurugi-cho, Mima-gun, Tokushima Prefecture (Abe 1990). *Veronicastrum noguchii* is also considered to be endangered and awaits an official conservation plan.

Materials and Methods

We made several visits to Isumi-shi, Chiba Prefecture, to collect herbarium specimens of *Veronicastrum noguchii*. Small portions were also obtained to propagate the plants vegetatively. We studied herbarium specimens deposited in the Natural History Museum and Institute, Chiba (CBM), that had been determined as *V. villosulum* by Noguchi *et al.* (2009), obtained a photograph of the holotype specimen of *V. villosulum* (L0420659) from the National Herbarium of the Netherlands-Leiden (L), and studied photos of specimens of *V. villosulum* provided by the Tokushima Prefectural Museum (TKPM). We also visited Tsurugi-cho, Tokushima Prefecture, on 6 September 2011, to observe the native habitat of *V. villosulum* and obtained several individuals from Hirotake Yasuda, who is protecting the natural population. We visited the habitat of *V. villosulum* at Tarui-cho and Ikeda-cho, Gifu Prefecture, on 25 July 2012, and observed flowers and other organs. *Veronicastrum noguchii* and *V. villosulum* were grown in Noda-shi, Chiba Prefecture, under conditions similar to those of their natural habitat. Fortunately, cultivated plants of both species bloomed almost simultaneously in July 2012, allowing a close comparison of the floral morphology. Chinese species of the section *Plagiostachys* were studied via the Chinese Virtual Herbarium (http://www.cvh.org.cn/cms/).

Results and Discussion

Veronicastrum noguchii K. Uehara, K. Saiki & T. Ando, **sp. nov.**—Figs. 1, 2, 3A (right), 3B (right row), 3C (right), 3D (right).

Resembling *Veronicastrum villosulum* (Miq.) T. Yamaz., but differing in stem hairs recurved; leaf base cordate or occasionally truncate, margin crenate, surface sparsely pilose except on ribs on lower surface; bracts narrowly oblong to ovate, surface sparsely pilose; calyx lobes narrowly triangular to linear, surface subglabrous.

Typus. JAPAN. Chiba Prefecture, Isumi-shi, Ōno, 35°15′ N, 140°17′ E, 12 July 2012, *K. Uehara & T. Ando s.n.* (holo- TI; iso- CBM, KYO, L, NY).

Herb perennial. *Stems* slender, ascending from base, arching apically, rooting and forming a new shoot when apex touches ground (Fig. 1A), terete, villose; hairs curved (Fig. 3A, right). *Leaves* alternate, chartaceous, becoming much smaller toward shoot apex (Fig. 1A); petiole 2–5 mm long, pilose; blade ovate, (2–)7–10 cm long, (1–)4–6 cm wide, sparsely pilose, base cordate or occasionally truncate, margin crenate with crenations apiculate, apex acuminate, midrib and nerves raised on lower surface, pubescent, prominent lateral nerves 6–12, usually 3–4 lateral nerves emerging from or slightly above base of midrib (Figs. 1A, 2A, & 3B, right row; see also Fig. 1 in Noguchi *et al.* 2009). *Flowers* July to August. *Spikes* axillary, sessile, subglobose, 2–3 cm long and wide (Figs. 1B & 2B). *Bracts* narrowly oblong to ovate, apex acuminate, ca. 4 mm long, surface sparsely pilose (Figs. 1C & 3C, right), usually reddish purple while subtended flower is in small bud stage. *Calyx* 5-lobed almost to base; lobes narrowly triangular to linear, apex acuminate, ciliate, subglabrous, ca. 5 mm long (Figs. 1C & 3D, right). *Corolla* ca. 7 mm long, tubular, dark bluish purple, glabrous outside, pubescent inside, 4-lobed; lobes deltoid, acute, ca. 2 mm long (Figs. 1C & 3D, right). *Stamens* 2, exserted, 11–12 mm long; filaments pubescent in lower half, adnate to base of corolla (Fig. 1D). *Ovary* ovoid, ca. 1 mm long, glabrous; *style* filiform, glabrous, 14–15 mm long (Fig. 1D). Capsules and seeds not seen.

Distribution. Known only from Ōno, Isumi-shi, Chiba Prefecture, Japan, which appears to be the eastern extent of the distribution of section *Plagiostachys* (Fig. 4).

Habitat. The native habitat of *Veronicastrum noguchii* is a steep, southwest-facing slope beside a stream. The site is considerably shaded by evergreen trees. Sandstones in the area are easily eroded by the stream, forming a deep gorge, al-

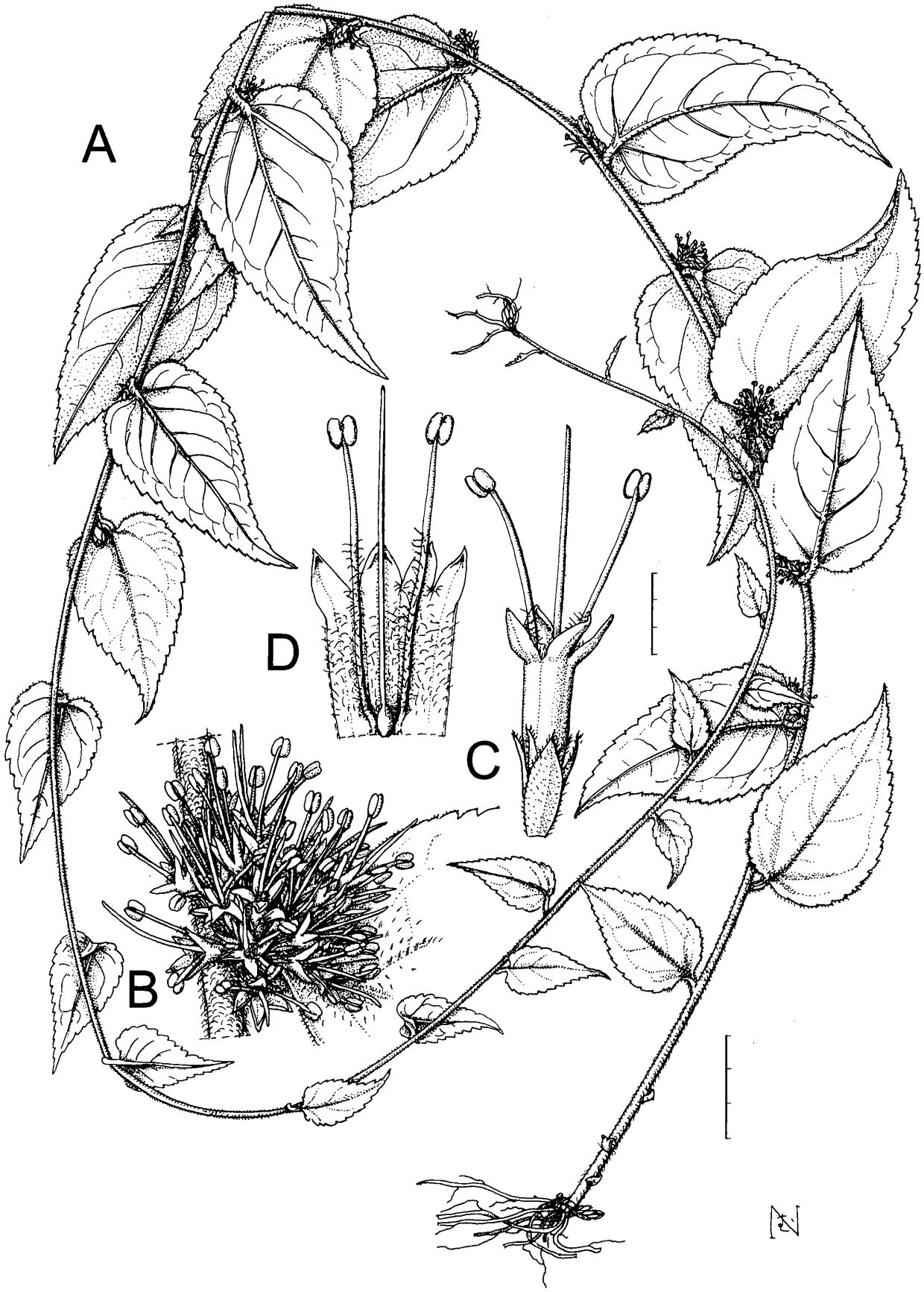

FIG. 1. *Veronicastrum noguchii* K. Uehara, K. Saiki & T. Ando. A: Habit at flowering in July. B: Spike. C: Flower with bract. D: Dissected corolla, stamen, and pistil. Scale bar = 3 cm for A, 3 mm for C and D. Scale bar is not provided for B.

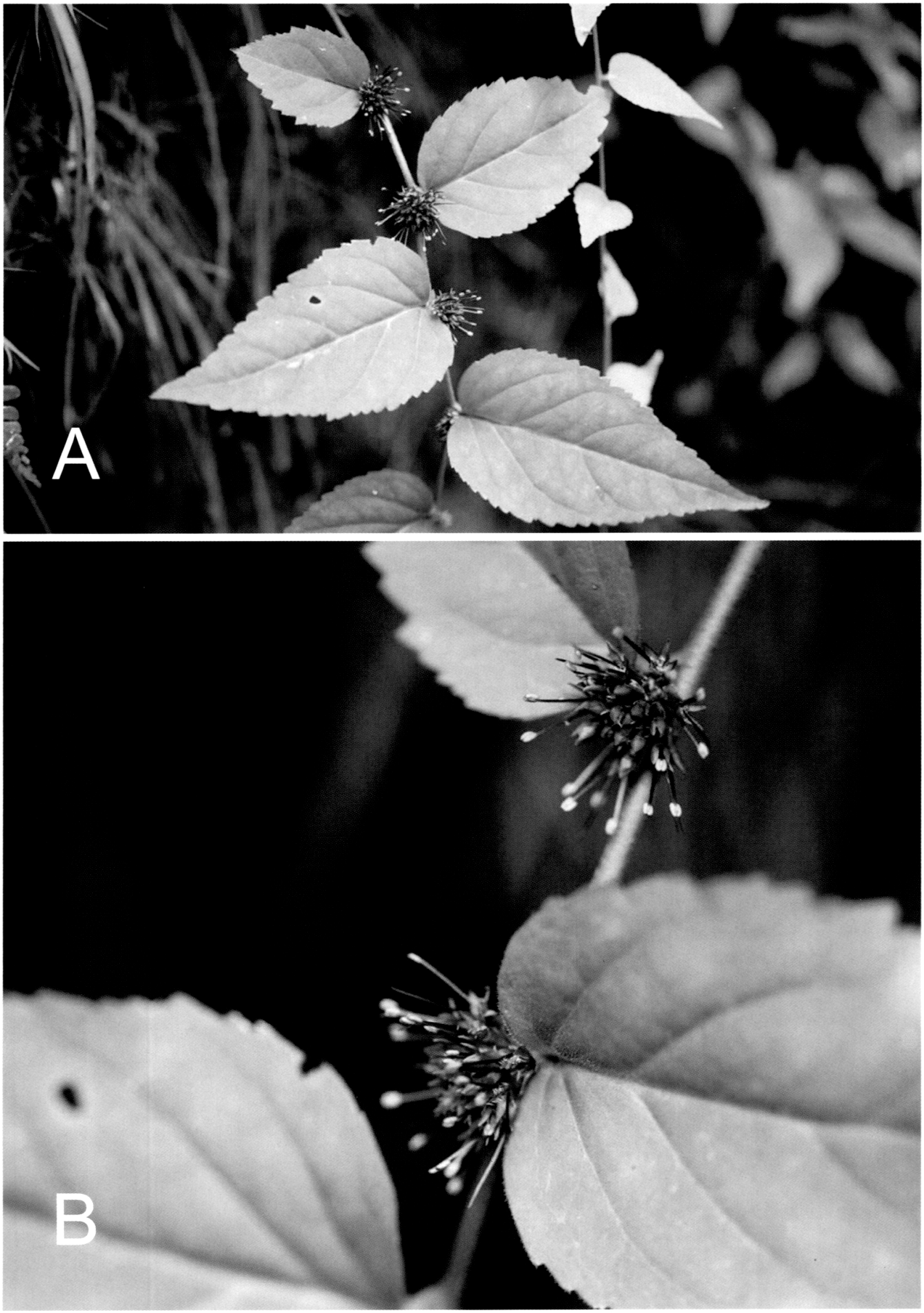

FIG. 2. *Veronicastrum noguchii* in its native habitat at Isumi-shi, Chiba Pref. A: Plants. B: Spikes.

though the altitude is only 30 m above sea level. The population of *V. noguchii* we observed was small, with ca. 100 individuals.

Etymology. *Veronicastrum noguchii* is named after Mr. Shouzo Noguchi, an enthusiast of the flora of Chiba Prefecture, who discovered this species on 4 May 2009.

Japanese name. Isumi-suzukake (nov.)

Other specimens examined. JAPAN. Chiba Prefecture, Isumi-shi, Oono Kawame, 4 May 2009, *S. Noguchi s.n.* (CBM 319973); Isumi-shi, Oono Kawame, 22 August 2010, *S. Noguchi s.n.* (CBM 311141); Ohno, Isumi-shi,

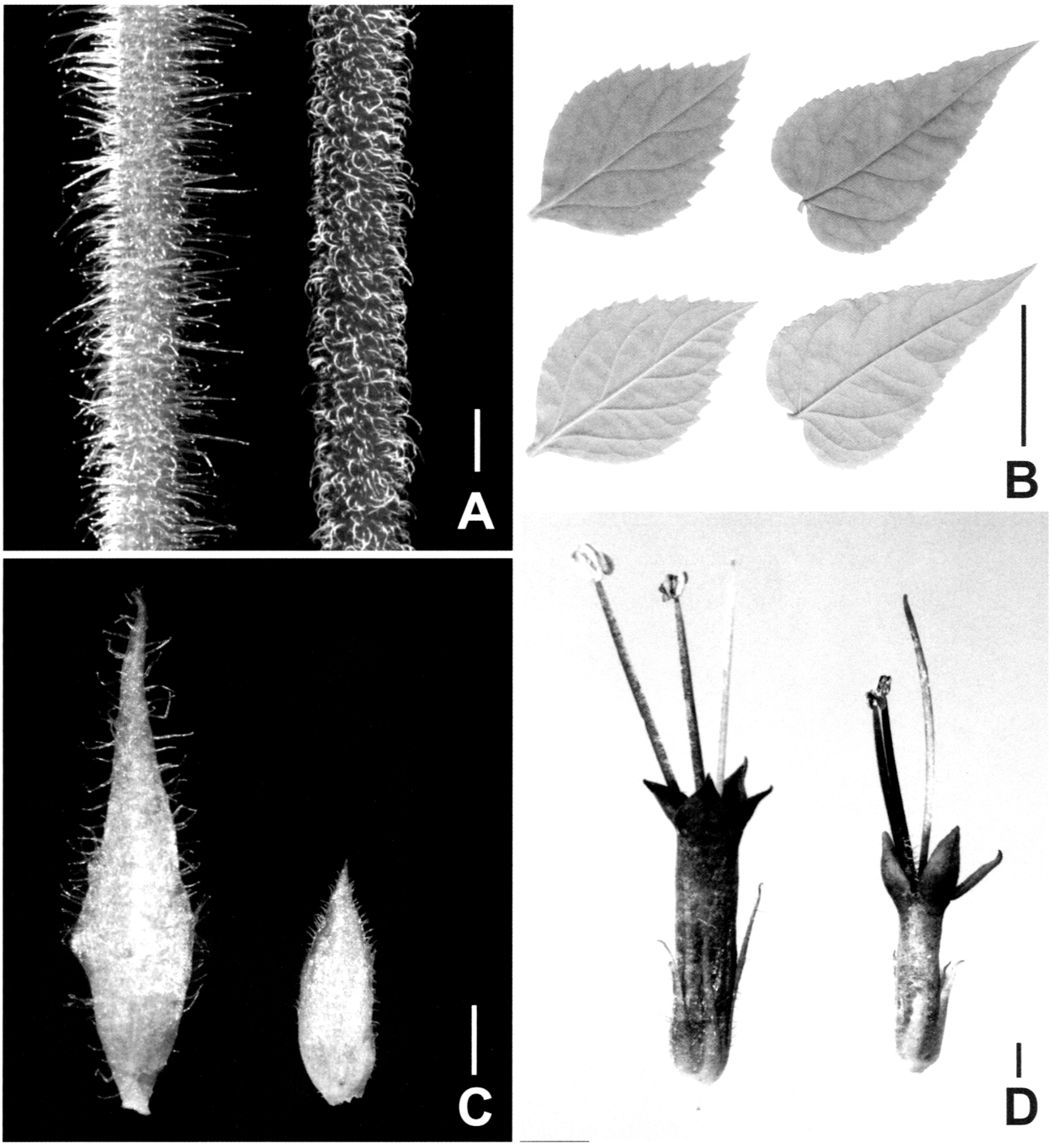

FIG. 3. Morphological characteristics of *Veronicastrum noguchii* (right) compared to those of *V. villosulum* (left). A: Hairs on young stem. B: Adaxial (upper row) and abaxial (lower row) leaf surfaces. C: Abaxial view of bracts. D: Side view of flowers, subtending bract on right side removed. Scale bar = 1 mm for A, C, and D; 5 cm for B.

Chiba, 15 July 2009, *K. Ohno, T. Furuki, S. Noguchi, T. Iwase, M. Kubota & M. Nemoto s.n.* (CBM 275990). (All three specimens were originally determined as *Veronicastrum villosulum*); Isumi-shi, Ōno, 3 July 2012, *K. Uehara, M. Ito & T. Ando s.n.* (TI, TKPM, TNS).

Note. Veronicastrum noguchii resembles *V. villosulum* in the morphology of the inflorescence. In section *Plagiostachys*, only these two species develop subglobose inflorescences. Inflorescences of the remaining species are cylindrical or conical (Yamazaki 1957, Chin & Hong 1979, Hong *et al.* 1998). Morphological distinctions between *V. noguchii* and *V. villosulum* are summarized in Table 1.

In China, *Veronicastrum villosulum* is variable in indumentum, leaf margin, corolla length, and merosity. Four infraspecific taxa are recognized: var. *villosulum*, var. *hirsutum* T. L. Chin & D. Y. Hong, var. *parviflorum* T. L. Chin & D. Y. Hong, and var. *glabrum* T. L. Chin & D. Y. Hong (Hong *et al.* 1998). However, the morphology of the leaf base of these taxa is within a range that can be described as "mostly broadly cuneate to rarely rounded" (after Hong *et al.* 1998), and prominent lateral nerves do not emerge from the base of the midrib. These morphological features of the leaves are distinctive in *V. noguchii*. Var. *glabrum* and var. *parviflorum* differ from *V. noguchii* in having glabrous stems and small white flowers, respectively. Stems of var. *hirsutum* are covered with non-glandular curved hairs like those of *V. noguchii*, but the indumentum of the leaf blade (hirsute) and bracts, as well as the calyx lobes (with glandular hairs), of this taxon differ from those of *V. noguchii*.

Like *Veronicastrum noguchii*, *V. robustum* subsp. *grandifolium* T. L. Chin & D. Y. Hong, which occurs in China (see *H. F. Chin 700872* and others deposited in the Guangxi Institute of Botany Herbarium: IBK), has leaves with a cor-

TABLE 1. Morphological comparison of *Veronicastrum noguchii* and *V. villosulum*.

Organ		*Veronicastrum noguchii*	*Veronicastrum villosulum*	Figure
Stem		villose, with curved hairs	glandular-villose, with straight hairs	Fig. 3A
Leaves	base	cordate occasionally truncate	cuneate to obtuse	Fig. 3B
	margin	crenate	serrate	Fig. 3B
	surface	sparsely pilose	densely glandular-villose	
	prominent lateral nerves	usually emerge from base or slightly above base of midrib	emerge from midrib	Fig. 3B
Bracts		Narrowly oblong to ovate, acuminate, ca. 4 mm long, sparsely pilose, usually reddish purple when subtended flower is in young bud stage	linear-lanceolate, acuminate, 7–9 mm long, glandular-villose, consistently green	Fig. 3C
Calyx	lobe	narrowly triangular to linear, acuminate, subglabrous	linear-lanceolate, glandular-villose	
Corolla	tube	ca.5 mm long	7–8 mm long	Fig. 3D
	lobe	ca.2 mm long, acute	1–1.5 mm long, acuminate	
Stamens		11–12 mm long, shorter than pistil	14–15 mm long, as long as pistil	Fig. 3D

date base and prominent lateral nerves emerging from the base of the midrib, but the leaf margin is serrate, the stem is glabrous, and the inflorescence is cylindrical, unlike *V. noguchii*.

Muro (1953) noted a bamboo forest situated at Aza-Yashiki, Naka, Fuchu-mura, Fuwa-gun, Gifu Prefecture, owned by Yoshiaki Kotake, as the natural habitat of *Veronicastrum villosulum*. That habitat has been destroyed, but individuals transferred from the forest are currently in the garden of Kazuyoshi Kotake at Fuchu, Tarui-cho, Fuwa-gun, Gifu Prefecture. *Veronicastrum villosulum* is also present in a bamboo forest at Shoko-ji Temple at Katayama, Ikeda-cho, Ibi-gun, Gifu Prefecture.

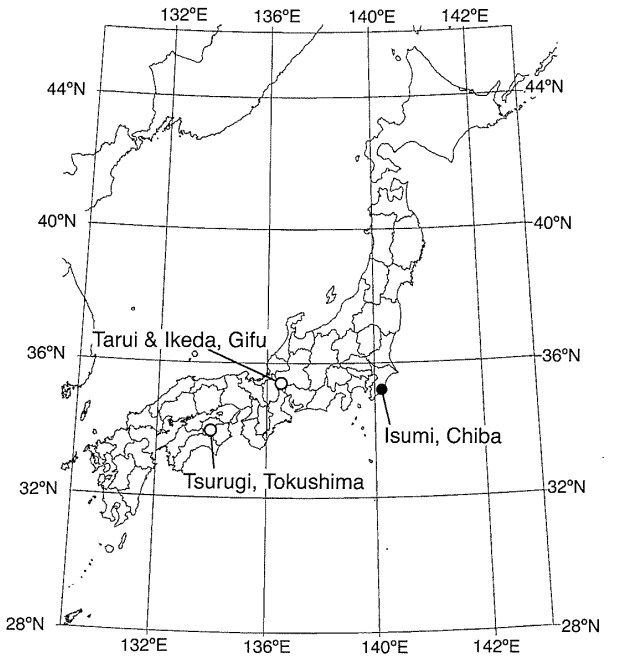

FIG. 4. Distribution of *Veronicastrum noguchii* (solid circle) and *V. villosulum* (open circles) in Japan.

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